

## Dyno Cap for 2013 944 Spec

Posted by Sterling Doc - 30 Oct 2012 08:14

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Guys, for 2013 will be moving to a dyno cap of  $(HP + TQ)/2 = 138$ , with a 2 HP allowance for dyno variation. I know there will be many questions on the whys and how's of this, so I'll go through many of the ones I expect below. Please pull up a chair, and read all of the following before commenting on this thread.

### ***Why is this necessary?***

It is important to go back to the foundation of our rules,- the purpose and claim that have defined our rules from the beginning to understand this, so I've copied it below:

#### *1 Definition and Claim*

*The Porsche 944™-924S™ spec class is a class for those individuals that wish to race a Porsche in a competitive series with limited expense and low cost of operation. These rules are intended to control costs and reduce any performance advantage from the cars so that driving ability and*

*race setup are the greatest factors in determining winners. The following are approved and disapproved items for the class. **The spirit of the class is for all cars to be equal in weight and horsepower and be competitive with one another. The focus will be on driver ability and not dollar ability. This class is not intended to be an engine builder or innovator's class.***

When the class started 10 years ago, a good motor was in the low 130's. As the class has grown, become more competitive, and talented engine builders have become involved, we now have reliable dyno data to show legal motors reaching into the mid 140's in HP & TQ. It is has come time to codify the spirit of the rules to allow standard, well built motors to remain competitive, at the highest levels. Over the last two years of testing and data collection (nearly 100 dyno tests), we have found a very good standard rebuild produces around 134-5 HP, give or take a couple. This rule is built around those cars - the meat of the class.

This 138 HP cap can be approached by any solid motor build, low or high compression, with a bit of tuning. This cap can also be met by higher output motors through simple, cheap, and reliable means of detuning. Both of these things have been tested extensively through NASA's support, and we will provide a clear path to tuning up lower HP cars, and detuning cars that fall over the cap (details to follow). The result will be a tighter spread of horsepower throughout the class, better racing, and it will make the class more accessible to new drivers/builders for less build cost. This is the spirit of 944 Spec rules, as carefully laid out by the class founders.

***What are the specifics?***

The rule will be  $(HP + TQ)/2 = 138$ , +2 to account for dyno variation. While the intent is for cars to approach an average of 138 HP and TQ, disqualification will not occur until a car reaches  $(HP + TQ)/2 = 140$  or greater. This number will be determined by the average of 3 dyno pulls, with a very tight dyno procedure, including a spec for tire pressure (30 PSI), and oil temperature (>160 degrees), using SAE correction, smoothing factor 5. This procedure dramatically reduces dyno variations when followed correctly.

***Will a dyno be required to start the season?***

No. At this time, this rule will be used for enforcement, but will not require a dyno test before competing in 2013. The cap is set at a level that most standard built motors will not fall out. However, not having a dyno done will not excuse a violation of this rule if tested.

It is *highly recommended* that competitors put their car on the dyno once, and not just for rules compliance. As we have sought out previously untested cars for reference, we have found many of them running dangerously lean in Spec configuration. We have also found many issues on the dyno that would have resulted in a DNF, or motor failure in the future. It is far cheaper to find this on the dyno, than to waste a race weekend. Additionally, we have found HP gains of 2-5 HP through correcting air fuel ratios, on most all cars tested. If there was a part that would add 2-5 HP for \$100, there would be a long waiting list for this part! A dyno test session will do that for you. Local series directors can work on organizing group dyno days to help each region do this in a cost effective manner. This will also help enhance transparency in the class. Locally, it cost me \$100/hour to rent the dyno for my car. In recent testing, it took me less than 1/2 that time to dial in my motors air fuel ratios, and gain 2 HP. The other test car gained 5 HP (was running dangerously lean to start with!).

It is possible that a baseline/pre-competition dyno may be required in the future, but the intent now is not to require it by force of rule.

***Will I have to pay for a compliance dyno?***

No. Cars selected for verification at an event will not have to pay for a dyno. These costs are borne by NASA. The results are then the property of NASA, and not the racer. Air/fuel ratios are not assessed.

### ***How do I detune my car if needed?***

Our testing has shown several effective paths to detuning:

- The cheapest is to turn the fuel quality switch to position 4, which retards timing. This was a factory allowance to deal with lower octance gas. Our testing has shown it lowers removes about 4 HP. This lowers power throughout the HP curve, and nicely mimics a lower performance motor
- Our throttle bodies are 55mm in diameter. Placing a 52mm diameter restrictor between the throttle body, and intake manifold, removes about 2 HP, and slightly less torque, though it does seem to affect power through the rev range as well. A 50mm restrictor takes away 3-3.5 HP. Smaller restrictors should see similar incremental losses in HP. These plates can be made with simple sheet aluminum for nominal cost. There is no regulation on the restrictor itself, only its effect on horsepower.
- A more restrictive muffler is effective as well. For reference, a Dynomax Hushpower muffler removed 3-5 HP over the rev range versus a short staight pipe.
- We found no modifications that significantly manipulated the area under the curve, while chopping off the peak HP, within Spec rules. It would seem to require custom chip tuning to accomplish this, which is not legal in Spec rules. Our cars have very flat TQ curves as is, which would be hard to improve on significantly.

### ***How do I tune up my lower performing motor to come closer to the cap?***

- First it is critical that the cars ignition, fuel, and air intake systems are in top shape. We have found an amazing amount of pathology here. In particular, make sure you AFM is in good repair. A testing procedure is here: <http://www.clarks-garage.com/pdf-manual/elect-22.pdf> . You can also see how it performs on the dyno. A good AFM will give you a nice flat air fuel ratio throughout the rev range.
- The next critical step is to tune the air fuel ratios on the dyno - significant gains are often found here. Look here for tips: <http://www.944spec.org/944SPEC/forum/general/11260-tuning-afm?limit=6&start=18>
- Head shaving is worthwhile, especially for low compression cars. Personally, I would stay a good 10 thousandths above the stated minimums in the rules for low, and high compression pistons.
- Beyond that is small potatoes. Opening the internal restriction on the factory collector (Y-pipe just beyond the headers) seems to be worth about 1.5 to 2 HP. Hanksville Hotrods has an elegant bolt on solution, or the merge area can be modified by an exhaust shop. David Dirks has an effective method that he can share.
- Some cars seem to like certain computers better than others, but we could not find any pattern. The '88 computer was not found to be universally better. Engine hardware (early vs. late) is less important than the state of tune, for the average builder.
- We tested aftermarket chips, and found them \*not\* to be an effective bolt on solution. They will remain

not legal for this class

***Was this rule driven by cheating, or junkyard motors?***

No. I am proud of the level of integrity this class has shown. I do not expect that junkyard motors will be nationally competitive with this rule, and that is not its intent. It was driven the spirit of the rules, the progression of motor builds, and my conversation with racers and series directors across the country. Many of these conversations were in person through my efforts to visit the different regions, others by phone and email. The regional directors have been in the loop, and are in agreement, even the ones who will have to detune as a result of this. I understand not everyone is on board with this, and that I have not talked to all of you. My overall impression remains firm.

***Can't racers cheat around this rule?***

Yes. However, I expect we will continue to maintain our high level of integrity. Keep in mind, that a disqualification for being over HP, like being under weight, must be taken as a "0" in points (i.e cannot be dropped). Push the limit at your peril. Dynos are not frequently available outside of nationals, but it does happen. Many other classes deal with this same issue. As all the current Spec rules remain in place, the situation cannot be worse than it is as far as the spread of power.

***Why not just add weight?***

*The spirit of the class is for all cars to be **equal** in weight and*

*horsepower and be competitive with one another..*

Adding weight adds complexity, wear and tear, and creates the opportunity to create "horses for different courses" - high/HP weight for one track, and lower HP/weight for another track. Balanced is not the same as equal.

Sorry this is so long, but it is important!

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**Re: Dyno Cap for 2013 944 Spec**

Posted by joeblow - 10 Nov 2012 08:23

I would say run the car as delivered by the driver as it comes off the track(Hot/Cold/Whatever), if it goes under then they are good. If it is tested right after it comes off the track then that is as it was raced.

**cbuzzetti wrote:**

Excellant points Big Dog!!

A defined testing procedure should be in the ruleset and public knowledge.

I had mentioned this in another thread but it pertains to this as well.

The transaxle fluid temp will alter HP results. It is a heavy oil and if you only warm up your engine off track and then go to the dyno as opposed to comming off the track after a session the results will be different. I dont have any data to support this but how could it not affect the results with a heavy gear oil, we know what light engine oil does.

So do we need to have a minimum transaxle temp?

I know that some SM guys will run the lightest oil possible in their engine and gear boxes to get the best HP to the ground and are willing to sacrifice longevity in the process.

I agree with Foxx that we need to have a very defined testing procedure for dyno pulls with all possible variables considered.

Such as:

SAE correction

Smoothing factor 5

Engine oil temp

Transaxle temp

Maximum RPM

4 gear only pull

30 psi tire pressure with Spec tire

This is not a complete list, please add your additions and comments so that we do not make a boondoggle of this. A narrowly defined procedure will be best for the class.

I would rather not have any dyno rule but of we are forced to have one then it needs to be a well written rule with no loopholes or omissions that would cause a competitor to be accidentally DQed.

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## Re: Dyno Cap for 2013 944 Spec

Posted by Sterling Doc - 10 Nov 2012 09:05

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It is all in there except trans temps. These are hard to measure accurately on the dyno. To help deal with this issue, we will do some practice pulls until HP stabilizes, then run the 3 certification runs. Those will be final.

Once we decide on this issue, I'll get the whole procedure up. Rest assured it's very detailed. It takes points from all of existing dyno certification rules from other classes, and addresses some issues unique to our class.

Warming the trans is an issue to remember when doing your own testing, as well. Once HP stabilizes, you'll know everything is up to temp.

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## Re: Dyno Cap for 2013 944 Spec

Posted by Sterling Doc - 10 Nov 2012 09:12

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### **joeblow wrote:**

I would say run the car as delivered by the driver as it comes off the track(Hot/Cold/Whatever), if it goes under then they are good. If it is tested right after it comes off the track then that is as it was raced.

Joe, cars sometimes have to wait for a time, while others are dyno'd, and cars can cool down during that time. I'm not going to have guys fighting over who goes last, nor am I going to put a cold motor under a full bore dyno run. There will be nothing left random in the process. all cars will be warmed up.

I will probably annoy the dyno operators again by being so fussy, but so be it!

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**Re: Dyno Cap for 2013 944 Spec**

Posted by Big Dog - 10 Nov 2012 12:58

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Sorry for that, Eric.

As a practical matter, is there any difference between a DQ and a "last place"? I suppose there could be if there are 5 cars. A DQ would cost Toyo Bucks and a last place would not. I guess it could also affect season points but we have drops anyway.

As I understand it, the idea was a penalty for that particular race, not for life, not for a month, not for the rest of the event, just that race/quali, whatever. Is that correct?

I am fine with the notion of "last place"; rather than a DQ unless there is something I am missing.

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**Re: Dyno Cap for 2013 944 Spec**

Posted by Sterling Doc - 10 Nov 2012 13:46

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I should be more clear. The big difference between the two, is that a DQ for a rules infraction, cannot be dropped - i.e. you must take the 0 in points. A last place finish can be dropped. For regional points battles, that is a big difference.

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